a feedback circuit responsive to the voltage across the common load;

control circuits for controlling the first and second pulse width modulators responsive to the feedback circuit, the operation of the first and second pulse width modulators being interleaved;

the control circuits also being responsive to the difference in currents [current] through the first converter and the second converter to adjust the relative duty cycle of the first and second converters to tend to minimize the difference in the voltage across a [the] sense resistor;

[the current sense circuit,] the first pulse width modulator, the second pulse width modulator, the feedback circuit and the control circuits being in a single integrated circuit.

13. (Amended) The DC to DC switching circuit of claim 12 further comprised of an integrator having an output responsive to the integral of an error signal, the error signal being responsive to the voltage across the common load and a desired voltage, the control circuits also being responsive to the output of the integrator.

22. (New) A DC to DC converter having a plurality of converter circuits for operating into a common load, comprising:

a plurality of buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a plurality of pulse width modulators driven by a common oscillator in an interleaved manner, each pulse width modulator controlling one of the plurality of buck converter circuits, whereby the operation of the buck converter circuits is interleaved;

a feedback circuit responsive to a voltage across the common load;

a voltage control circuit controlling the plurality of pulse width modulators responsive to the feedback circuit and a commanded output voltage; and

a current balance control circuit responsive to the difference in currents in the plurality of interleaved buck converter circuits and controlling the pulse width modulators to balance the currents in the plurality of interleaved buck converter circuits;

the plurality of pulse width modulators and the control circuits being in a single integrated circuit.

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~~24~~. (New) The DC to DC converter of claim 22 further comprised of an integrator having an output responsive to the integral of an error signal, the error signal being responsive to the voltage across the common load and a desired voltage, the control circuits also being responsive to the output of the integrator.

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~~25~~. (New) The DC to DC converter of claim ~~24~~ wherein a time constant of the integrator is adjustable by the selection of at least one component external to the integrated circuit.

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~~26~~. (New) The DC to DC converter of claim ~~24~~ further comprised of a differentiator having an output responsive to the rate of change of the voltage across the common load, the control circuits also being responsive to the output of differentiator.

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~~27~~. (New) The DC to DC converter of claim ~~26~~ wherein the time constant of the differentiator is adjustable by the selection of at least one component external to the integrated circuit.

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~~28~~. (New) The DC to DC converter of claim 22 wherein the control circuits are also responsive to rapid decreases in the voltage across the common load to turn on the plurality of buck

converter circuits independent of the phase of the plurality of pulse width modulators.

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~~29~~. (New) The DC to DC converter of claim ~~28~~ wherein the control circuits are also responsive to rapid increases in the voltage across the common load to turn off the plurality of buck converter circuits independent of the phase of the plurality of pulse width modulators.

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~~30~~. (New) The DC to DC converter of claim 22, wherein the plurality of pulse width modulators consist of a pair of pulse width modulators.

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~~31~~. (New) The DC to DC converter of claim 22 wherein the feedback circuit is in the single integrated circuit.

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~~32~~. (New) A DC to DC converter having a plurality of converter circuits operating into a common load, comprising:

a plurality of buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a plurality of pulse width modulators each controlling one of the plurality of buck converter circuits, the operation of the

pulse width modulators and the buck converter circuits being interleaved;

a feedback circuit responsive to a voltage across the common load;

control circuits responsive to the feedback circuit and a commanded output voltage to control a nominal duty cycle of the plurality of buck converter circuits, the control circuits also being responsive to the difference in currents in the plurality of interleaved buck converter circuits to adjust relative duty cycles of the plurality of buck converter circuits to balance the currents in the buck converter circuits;

the plurality of pulse width modulators and the control circuits being in a single integrated circuit.

32. (New) The DC to DC converter of claim 31 wherein the control circuits control the plurality of pulse width modulators.

33. (New) The DC to DC converter of claim 31 further comprising an integrator having an output responsive to the integral of an error signal, the error signal being responsive to the voltage across the common load and a desired voltage.

34. (New) The DC to DC converter of claim 33, wherein the control circuits are also responsive to the output of the integrator.

35 ~~37~~. (New) The DC to DC converter of claim 33 ~~35~~ wherein a time constant of the integrator is adjustable by the selection of at least one component external to the integrated circuit.

36 ~~38~~. (New) The DC to DC converter of claim 33 ~~35~~ further comprising a differentiator having an output responsive to a rate of change of the voltage across the common load, the control circuits also being responsive to the output of differentiator.

37 ~~39~~. (New) The DC to DC converter of claim 36 ~~38~~ wherein a time constant of the differentiator is adjustable by the selection of at least one component external to the integrated circuit.

38 ~~40~~. (New) The DC to DC converter of claim 31 ~~32~~ wherein the control circuits are also responsive to rapid decreases in the voltage across the common load to turn on the plurality of buck converter circuits, independent of the phase of the plurality of pulse width modulators.

39 ~~41~~. (New) The DC to DC converter of claim 31 ~~32~~ wherein the control circuits are also responsive to rapid increases in the voltage across the common load to turn off the plurality of buck converter circuits, independent of the phase of the plurality of pulse width modulators.

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~~42~~. (New) The DC to DC converter of claim ~~32~~, wherein the plurality of pulse width modulators consist of a pair of pulse width modulators.

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~~43~~. (New) The DC to DC converter of claim ~~32~~ wherein the commanded output voltage is controllable through an input to the integrated circuit.

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~~44~~. (New) The DC to DC converter of claim ~~32~~ wherein the feedback circuit is in the single integrated circuit.

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~~45~~. (New) A DC to DC converter having a plurality of converter circuits operating into a common load, comprising:

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a plurality of buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a plurality of pulse width modulators each controlling one of the plurality of buck converter circuits, the operation of the pulse width modulators being interleaved;

control circuits for adjusting a nominal duty cycle of the plurality of interleaved buck converter circuits, the control circuits also being responsive to the difference in currents in

the plurality of interleaved buck converter circuits to adjust the relative duty cycles of the plurality of buck converter circuits to balance the currents therein;

the plurality of pulse width modulators and the control circuits being in a single integrated circuit.

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~~46.~~ (New) A DC to DC converter having first and second converter circuits operating into a common load, comprising:

first and second buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

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a first pulse width modulator controlling the first buck converter circuit;

a second pulse width modulator controlling the second buck converter circuit;

a feedback circuit responsive to the voltage across the common load;

control circuits for controlling the first and second pulse width modulators responsive to the feedback circuit;

the control circuits also being responsive to current measurements in the first buck converter circuit and the second buck converter circuit for adjusting the relative duty cycle of





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the first and second pulse width modulators to balance the currents in the buck converter circuits;

the first pulse width modulator, the second pulse width modulator, the feedback circuit and the control circuits being in a single integrated circuit.

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~~47~~. (New) A DC to DC converter having a plurality of converter circuits operating into a common load, comprising:

a plurality of buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a plurality of pulse width modulators driven by a common oscillator in an interleaved manner, each pulse width modulator controlling one of the plurality of buck converter circuits, whereby the operation of the buck converter circuits is interleaved;

a feedback circuit responsive to a voltage across the common load;

a voltage control circuit for controlling the plurality of pulse width modulators responsive to the feedback circuit and a commanded output voltage; and

a current balance control circuit responsive to the difference in currents in the plurality of interleaved buck





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converter circuits for controlling the pulse width modulators to balance the currents in the plurality of interleaved buck converter circuits;

the plurality of pulse width modulators, the feedback circuit, the voltage control circuit and the current balance control circuit being in a single integrated circuit.

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~~48~~. (New) A DC to DC converter having a plurality of converter circuits operating into a common load, comprising:

a plurality of buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

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a plurality of pulse width modulators each controlling power switching devices of one of the plurality of interleaved buck converter circuits, the operation of the pulse width modulators and the buck converter circuits being interleaved;

a feedback circuit responsive to a voltage across the common load;

control circuits responsive to the feedback circuit and a commanded output voltage to control a nominal duty cycle of the plurality of buck converter circuits, the control circuits also being responsive to the difference in currents in the plurality of interleaved buck converter circuits to adjust the relative

duty cycles of the plurality of buck converter circuits to balance the currents in the buck converter circuits;

the plurality of pulse width modulators, the feedback circuit and the control circuits being in a single integrated circuit.

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~~49~~. (New) A DC to DC converter having a plurality of converter circuits operating into a common load, comprising:

a plurality of buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a plurality of pulse width modulators each controlling one of the plurality of buck converter circuits, the pulse width modulators being driven by a common oscillator signal so that the operation of the pulse width modulators is interleaved;

control circuits for adjusting a nominal duty cycle of the plurality of interleaved buck converter circuits to control a voltage on the common load, and for responding to the difference in currents in the plurality of interleaved buck converter circuits to adjust the relative duty cycles of the plurality of buck converter circuits to balance the currents in the buck converter circuits;





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the plurality of pulse width modulators and the control circuits being in a single integrated circuit.

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~~50.~~ (New) A DC to DC converter having first and second converter circuits operating into a common load, comprising:

first and second buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a first pulse width modulator controlling the first buck converter circuit;

a second pulse width modulator controlling the second buck converter circuit;

a feedback circuit responsive to the voltage across the common load;

control circuits for controlling the first and second pulse width modulators responsive to the feedback circuit;

the control circuits also being responsive to current measurements through the first buck converter circuit and the second buck converter circuit to adjust the relative duty cycle of the first and second buck converter circuits

the first pulse width modulator, the second pulse width modulator and the control circuits being in a single integrated circuit.





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~~51.~~ (New) A DC to DC converter comprising:

a plurality of buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a plurality of pulse width modulators driven by a common oscillator in an interleaved manner, each pulse width modulator controlling one of the plurality of buck converter circuits, whereby the operation of the buck converter circuits is interleaved;

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a feedback circuit responsive to a voltage on the common output;

a voltage control circuit for controlling the plurality of pulse width modulators responsive to the feedback circuit and a commanded output voltage; and

a current balance control circuit for controlling the pulse width modulators responsive to a difference in currents in the inductors of the plurality of interleaved buck converter circuits to balance the currents in the plurality of interleaved buck converter circuits;

the plurality of pulse width modulators and the control circuits being in a single integrated circuit.





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~~52~~. (New) A DC to DC converter having a plurality of converter circuits operating into a common load, comprising:

a plurality of buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a plurality of pulse width modulators each controlling power switching devices of one of the plurality of buck converter circuits, the operation of the pulse width modulators and the buck converter circuits being interleaved;

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a feedback circuit responsive to a voltage across the common load;

control circuits being responsive to the feedback circuit and a commanded output voltage to control a nominal duty cycle of the plurality of buck converter circuits, the control circuits also being responsive to the difference in currents in the plurality of interleaved buck converter circuits to adjust the relative duty cycles of the plurality of buck converter circuits to balance the currents in the buck converter circuits;

the plurality of pulse width modulators and the control circuits being in a single integrated circuit.





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~~53.~~ (New) A DC to DC converter having first and second converter circuits operating into a common load, comprising:

first and second buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a first pulse width modulator controlling the first buck converter circuit;

a second pulse width modulator controlling the second buck converter circuit;

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a feedback circuit responsive to the voltage across the common load;

control circuits for controlling the first and second pulse width modulators responsive to the feedback circuit;

the control circuits also being responsive to current measurements in the first buck converter circuit and the second buck converter circuit to adjust the relative duty cycle of the first and second buck converter circuits;

the first pulse width modulator, the second pulse width modulator, the feedback circuit and the control circuits being in a single integrated circuit.





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54. (New) A DC to DC converter having a plurality of converter circuits operating into a common load, comprising:

a plurality of buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a plurality of pulse width modulators driven by a common oscillator in an interleaved manner, each pulse width modulator controlling one of the plurality of buck converter circuits, whereby the operation of the buck converter circuits is interleaved;

a feedback circuit responsive to a voltage across the common load;

a voltage control circuit for controlling the plurality of pulse width modulators responsive to the feedback circuit and a commanded output voltage; and

a current balance control circuit for controlling the pulse width modulators to balance the currents in the plurality of interleaved buck converter circuits responsive to the difference in currents in the plurality of interleaved buck converter circuits;

the plurality of pulse width modulators, the voltage control circuit and the current balance control circuit being in a single integrated circuit.

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~~55~~. (New) A DC to DC converter having a plurality of converter circuits operating into a common load, comprising:

a plurality of buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

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a plurality of pulse width modulators each controlling power switching devices of one of the plurality of interleaved buck converter circuits, the operation of the pulse width modulators and the buck converter circuits being interleaved;

a feedback circuit responsive to a voltage across the common load;

control circuits responsive to the feedback circuit and a commanded output voltage to control a nominal duty cycle of the plurality of buck converter circuits, the control circuits also adjusting relative duty cycles of the plurality of buck converter circuits to balance the currents in the buck converter circuits responsive to the difference in currents in the plurality of interleaved buck converter circuits;

the plurality of pulse width modulators and the control circuits being in a single integrated circuit.

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~~56.~~ (New) A DC to DC converter having a plurality of converter circuits operating into a common load, comprising:

a plurality of buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a plurality of pulse width modulators each controlling one of the plurality of buck converter circuits, the pulse width modulators being driven by a common oscillator signal so that the operation of the pulse width modulators is interleaved;

control circuits for adjusting a nominal duty cycle of the plurality of interleaved buck converter circuits to control a voltage on the common load, and for adjusting relative duty cycles of the plurality of buck converter circuits to balance the currents in the buck converter circuits;

the plurality of pulse width modulators and the control circuits being in a single integrated circuit.

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~~57.~~ (New) A DC to DC converter having first and second buck converter circuits operating into a common load, comprising:

first and second buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a first pulse width modulator controlling the first buck converter circuit;

a second pulse width modulator controlling the second buck converter circuit;

a feedback circuit responsive to the voltage across the common load;

control circuits for controlling the first and second pulse width modulators responsive to the feedback circuit;

the control circuits also being responsive to current measurements in the first buck converter circuit and the second buck converter circuit to adjust the relative duty cycle of the first and second pulse width modulators to balance the currents in the buck converter circuits;

the first pulse width modulator, the second pulse width modulator and the control circuits being in a single integrated circuit.

56. (New) A DC to DC converter having a plurality of converter circuits for operating into a common load, comprising:

a plurality of buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a plurality of pulse width modulators driven by a common oscillator in an interleaved manner, each pulse width modulator controlling one of the plurality of buck converter circuits, whereby the operation of the buck converter circuits is interleaved;

a feedback circuit responsive to a voltage across the common output;

a voltage control circuit controlling the plurality of pulse width modulators responsive to the feedback circuit and a commanded output voltage;

the plurality of pulse width modulators and the control circuits being in a single integrated circuit.

57. (New) The DC to DC converter of claim 56 further comprising the common oscillator, the common oscillator also being in the single integrated circuit.

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~~60~~. (New) A DC to DC converter having a plurality of converter circuits operating into a common load, comprising:

a plurality of buck converter circuits operating into the common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

a plurality of pulse width modulators each controlling one of the plurality of buck converter circuits, the operation of the pulse width modulators and the buck converter circuits being interleaved;

a feedback circuit responsive to a voltage across the common load;

control circuits responsive to the feedback circuit and a commanded output voltage to control a nominal duty cycle of the plurality of buck converter circuits;

the plurality of pulse width modulators and the control circuits being in a single integrated circuit.

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~~61~~. (New) The DC to DC converter of claim 60 further comprising the common oscillator, the common oscillator also being in the single integrated circuit.

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~~62.~~ (New) A DC to DC converter comprising:

first and second buck converter circuits operating into a common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

first and second pulse width modulators driven by a common oscillator in an interleaved manner, each pulse width modulator controlling a respective one of the first and second buck converter circuits, whereby the operation of the buck converter circuits is interleaved;

a feedback circuit responsive to a voltage across the common output;

a voltage control circuit controlling the first and second pulse width modulators responsive to the feedback circuit and a commanded output voltage;

the plurality of pulse width modulators and the control circuits being in a single integrated circuit.

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~~63.~~ (New) The DC to DC converter of claim 62 further comprising the common oscillator, the common oscillator also being in the single integrated circuit.

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~~64~~. (New) A DC to DC converter comprising:

first and second buck converter circuits operating into a common load, each buck converter circuit having an inductor for alternately conducting between the first power supply terminal and the common load, and the second power supply terminal and the common load;

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first and second pulse width modulators each controlling a respective one of the buck converter circuits, the operation of the pulse width modulators and the buck converter circuits being interleaved;

a feedback circuit responsive to a voltage across the common load;

control circuits responsive to the feedback circuit and a commanded output voltage to control a nominal duty cycle of the plurality of buck converter circuits;

the plurality of pulse width modulators and the control circuits being in a single integrated circuit.

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~~65~~. (New) The DC to DC converter of claim ~~64~~ 62 further comprising the common oscillator, the common oscillator also being in the single integrated circuit.

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